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EX PARTE OR LATE FILED

May 28, 1992

RECEIVED
MAY 28 1992
FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Ms. Donna Searcy
Secretary
Federal Communications Commission
1919 M Street, N.W., Room 222
Washington, DC 20554

92-100

Re: Ex Parte Presentation
Rulemaking No. RM-7617
Experimental License Nos. 1658
through 1662-EX-PL-90

Dear Ms. Searcy:

On May 27, 1992, I filed on behalf of PacTel Paging a notice of an ex parte presentation before certain members of the FCC's staff in regard to the above proceedings. That notice did not include reference to PacTel's request for an advanced messaging pioneer's preference, pending under File No. PP-38, and request for rulemaking (RM-7979), under Gen. Docket No. 92-100. Each of those matters were included in the summary materials provided with my May 27, 1992 letter.

An original and two copies of this letter, along with the summary materials, are being submitted herewith for inclusion in the records of the proceedings under Gen. Docket No. 92-100. In addition, I am also providing a copy of this letter to the FCC staff members with whom PacTel met on May 27.

Very truly yours,

Sandra K. Danner

Sandra K. Danner

Attachment

cc: Thomas P. Stanley, Office of Engineering and Technology
Fred Thomas, Office of Engineering and Technology
Anthony Serafini, Office of Engineering and Technology

DC01 25788

No. of Copies rec'd 0+2
List A B C D E

Advanced Architecture Paging Experimental License

Presentation to the FCC
May 27,1992

PacTel Paging
Telesis Technologies Laboratory

Background

- On February 20, 1991, an Experimental License was granted to Pacific Telesis to conduct RF propagation and system tests in five cities throughout the US. This license was subsequently transferred to Telesis Technologies Laboratory.
- On July 29, 1991, Telesis notified the commission of details of its experimental program for Advanced Architecture Paging (AAP).
- On August 2, 1991 PacTel Paging filed a Petition for Rulemaking proposing the allocation of a portion of the 930-931 MHz band for AAP.
- PacTel Paging, under the auspices of TTL, are presently continuing experimental tests with regard to AAP. These tests are being done under a special temporary authority issued December 27, 1991.

Definitions and Objectives

Definition: Advanced Architecture Paging

- AAP is an unformatted paging service which, unlike the present paging formats (POCSAG, GOLAY), does not impose internal formatting limitations, thus offering enhanced messaging capabilities, e.g. longer alphanumeric messages, E-mail, enhanced character sets

Objectives:

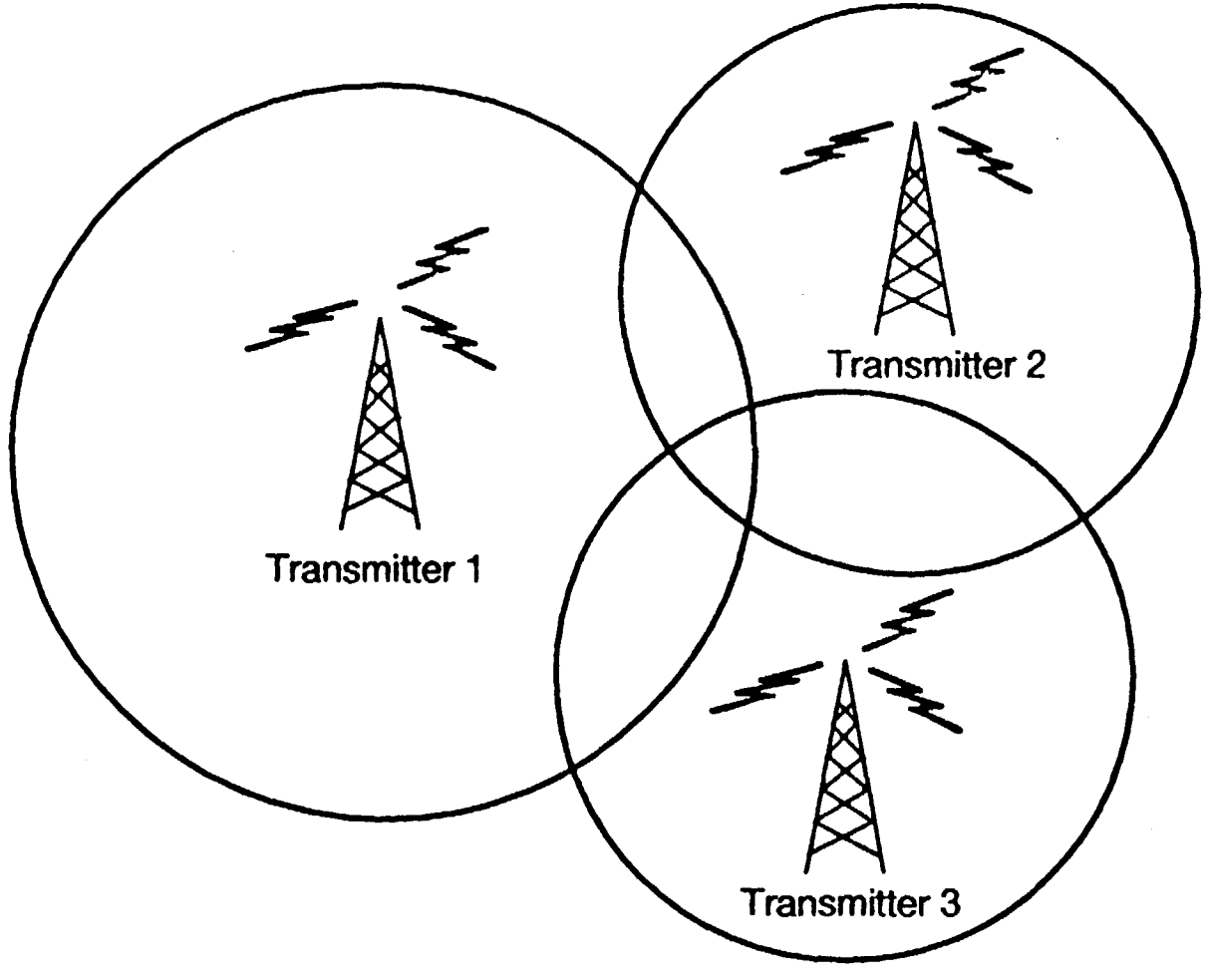
- In order to maintain or increase capacity for the enhanced messaging capabilities, AAP will require higher data rates.
  - Assess upper limit of present day paging:
    - Simulcast Environment
    - FSK Modulation
  - Investigate alternative modulation and coding schemes, bandwidths and data rates

Problem

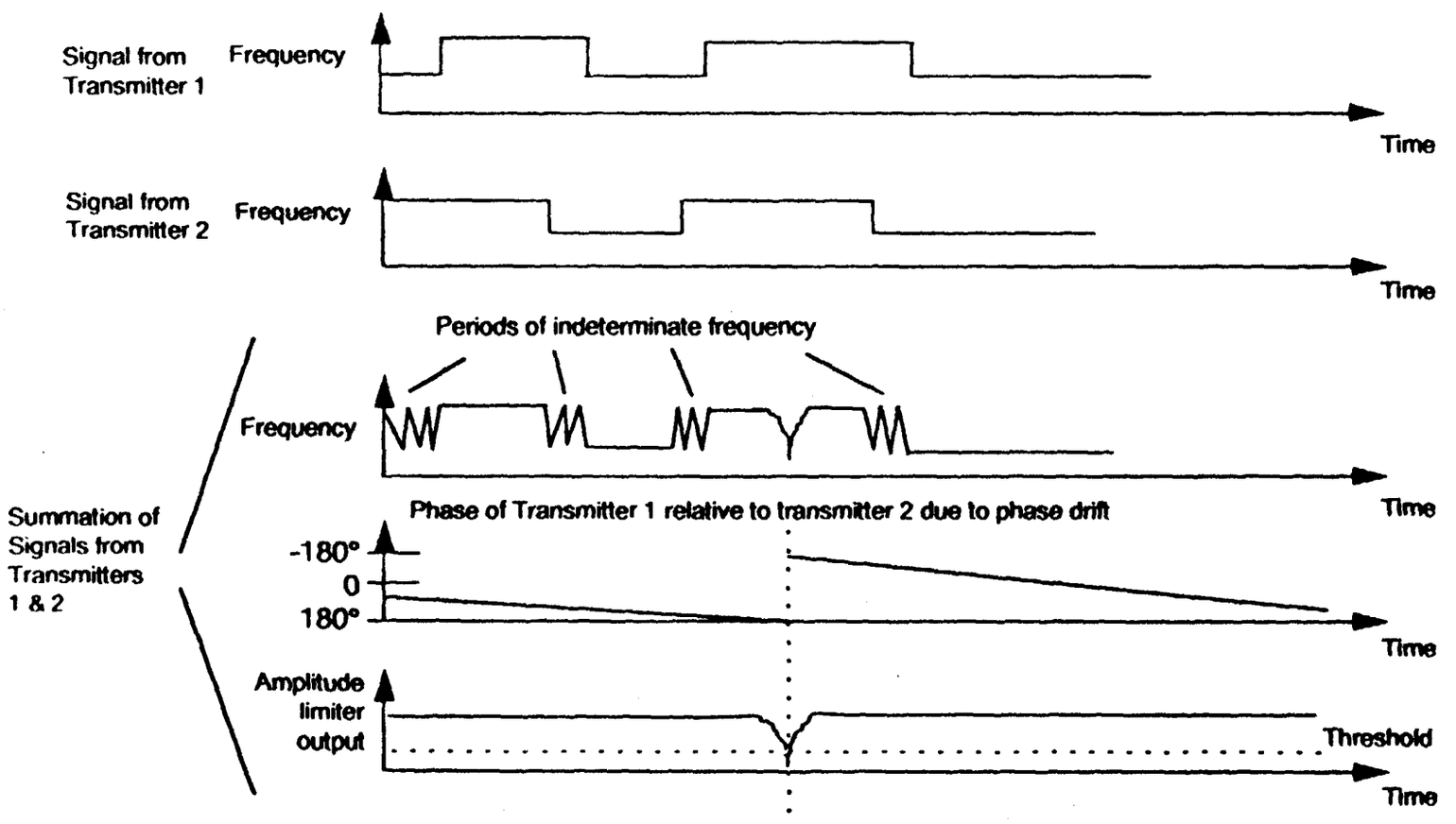
Simulcast Environment

- Relative Delays
  - Propagation
  - Hardware
- Relative signal strengths of signals
- Phasing of frequency references

Arrangement of Simulcast Transmitters



Modulation Waveforms



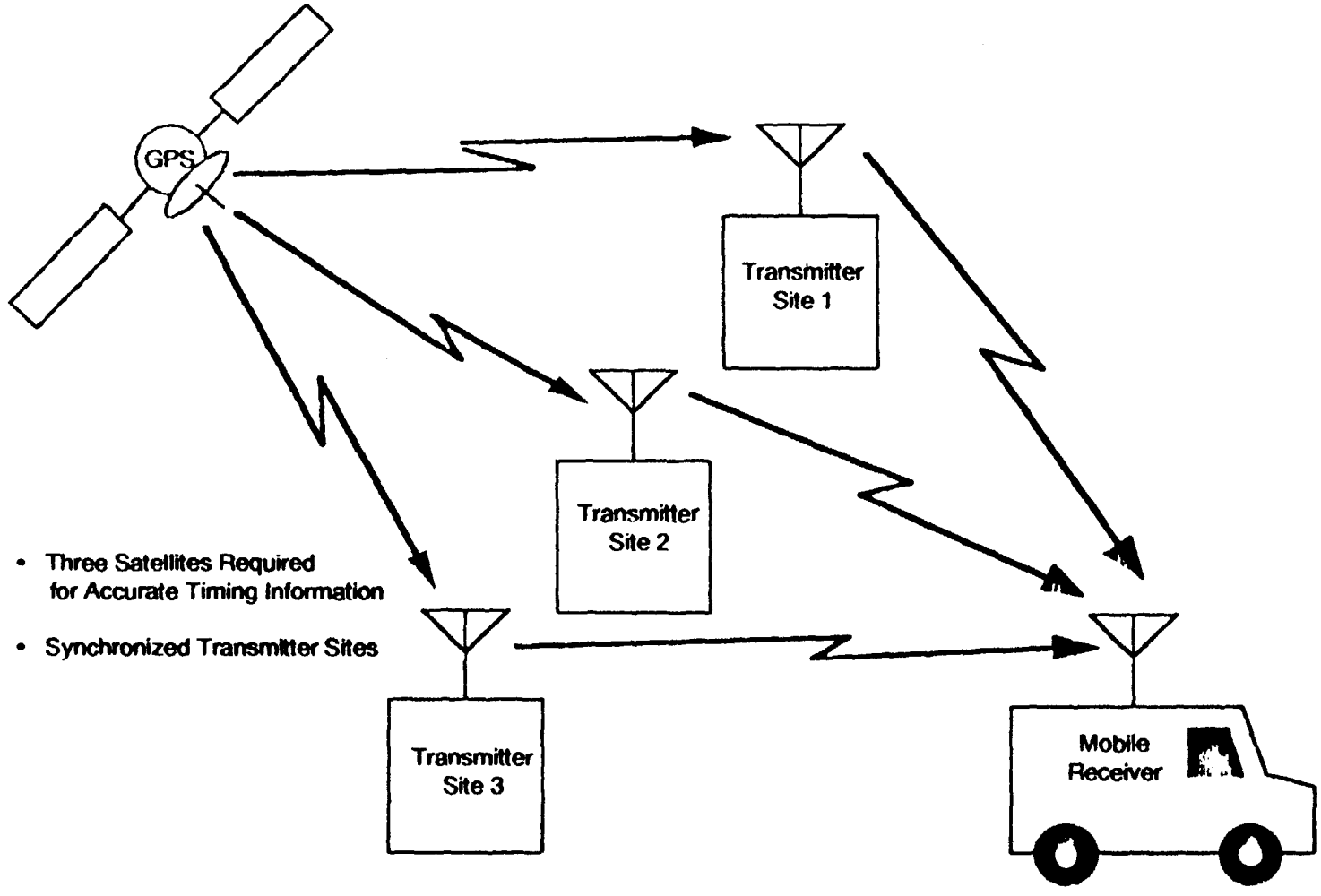
Approach

- Field measurements in simulcast environment
- 930-931 MHz frequency band
- Minimize hardware delays - use GPS
- Make measurements for various data rates and bandwidths:

Data Rate (kbaud)	Bandwidth (kHz)
1.2, 2.4, 3.2, 6.4	25
12.8	50

- Measurements include relative delay, relative signal strength, relative frequency offset and Bit Error Rate

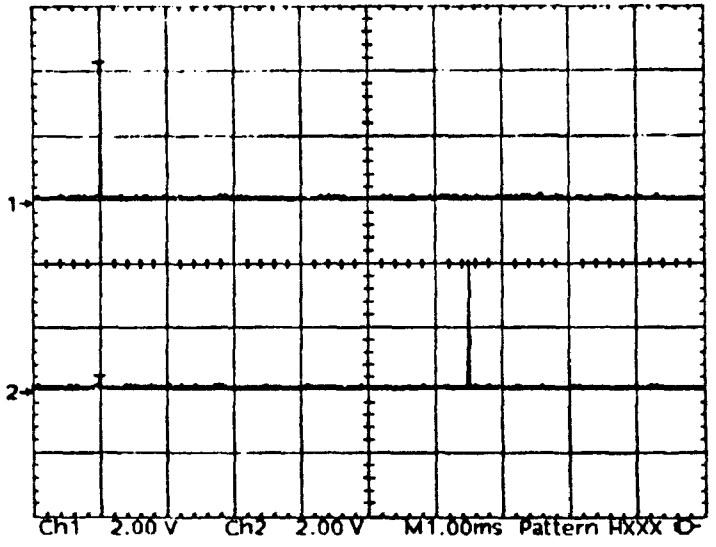
Simulcast Paging System Test

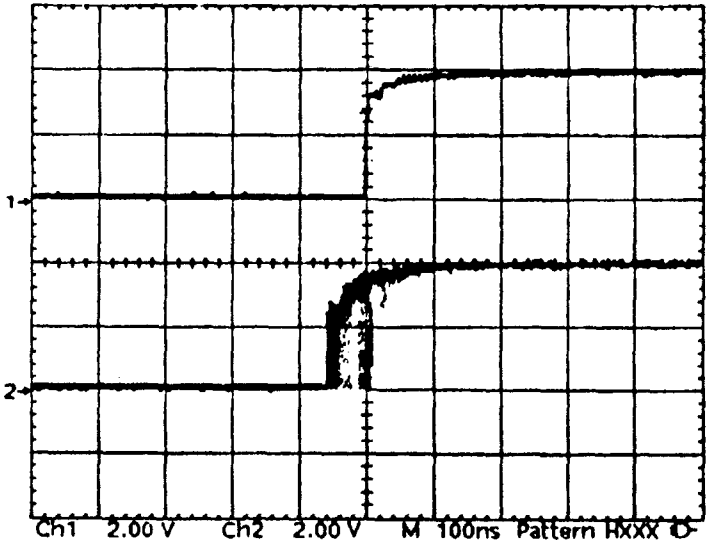


Methodology

GPS 1pps Synchronization

- Synchronization of transmit signals using GPS to within < 1 microsecond
- Pseudo random data sources

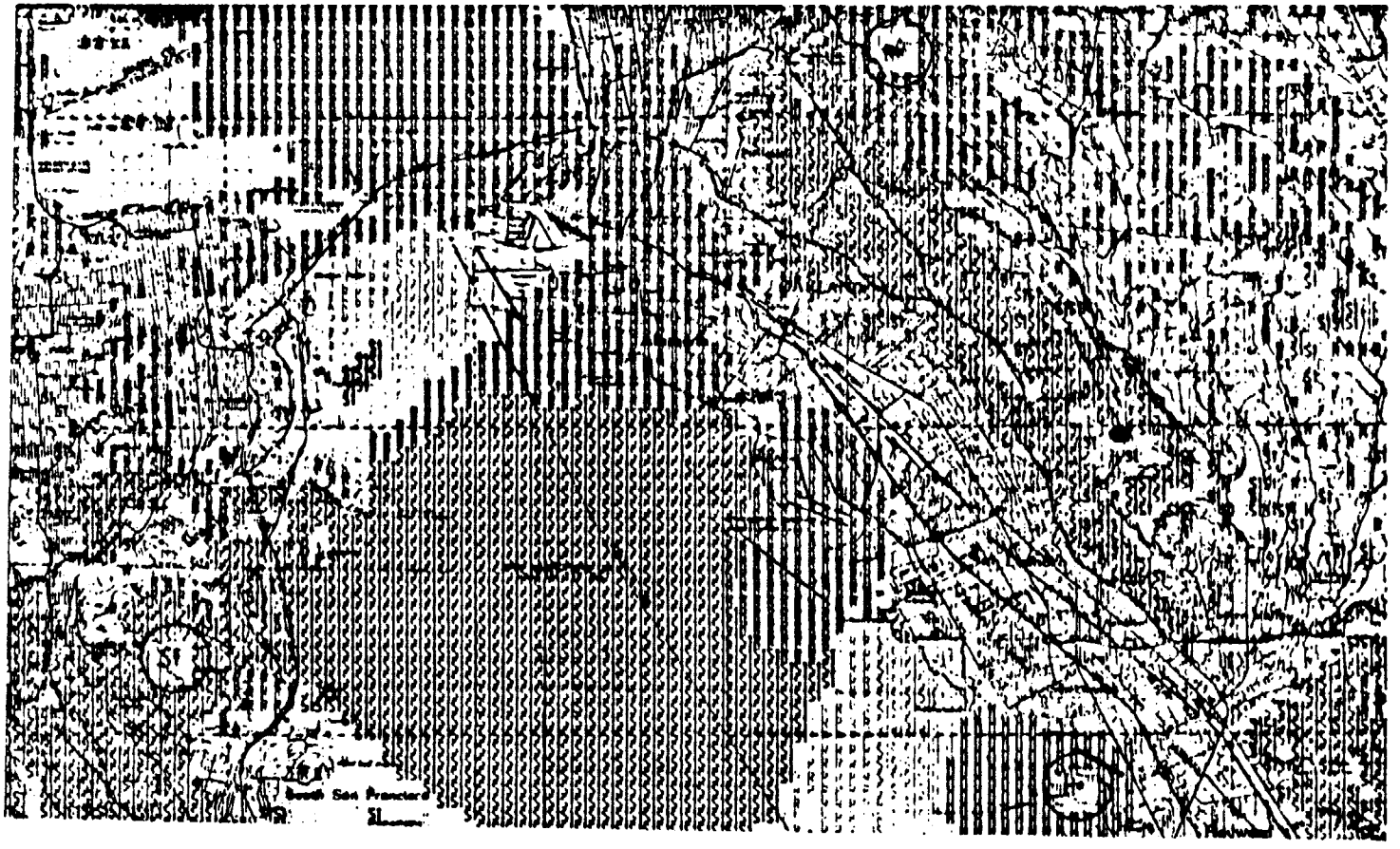




Methodology (Cont'd)

Best Server Coverage

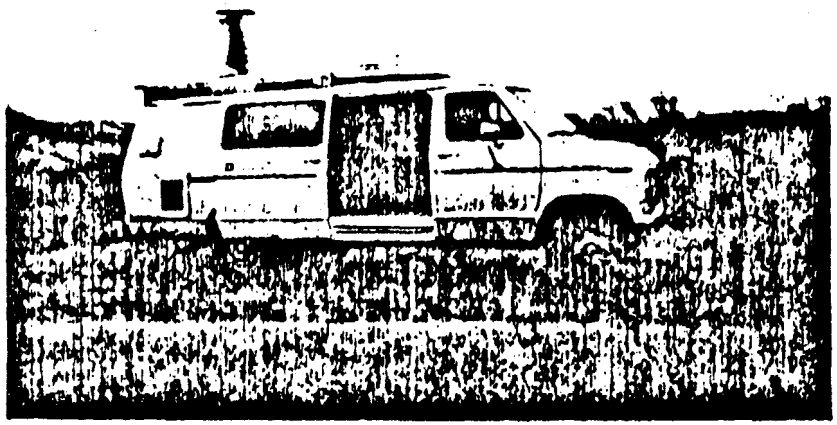
- Two existing PacTel Paging sites used

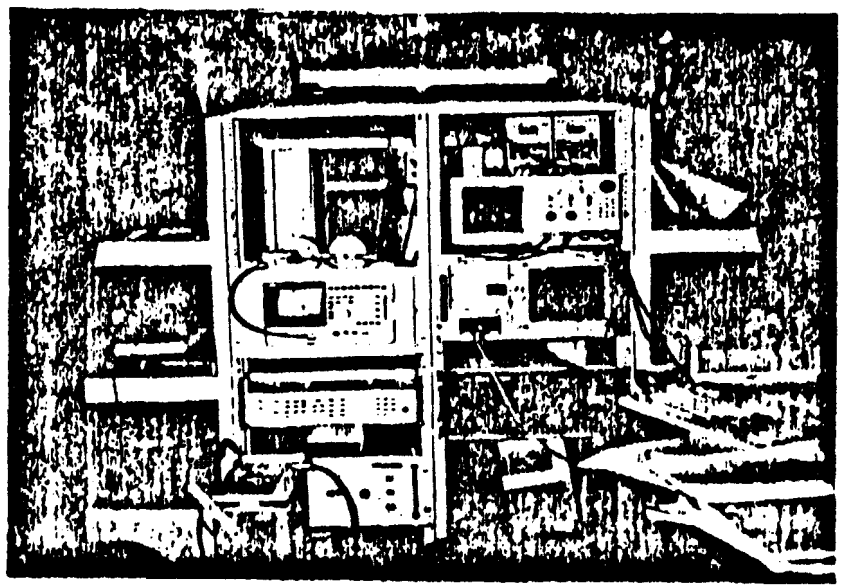


Methodology (Cont'd)

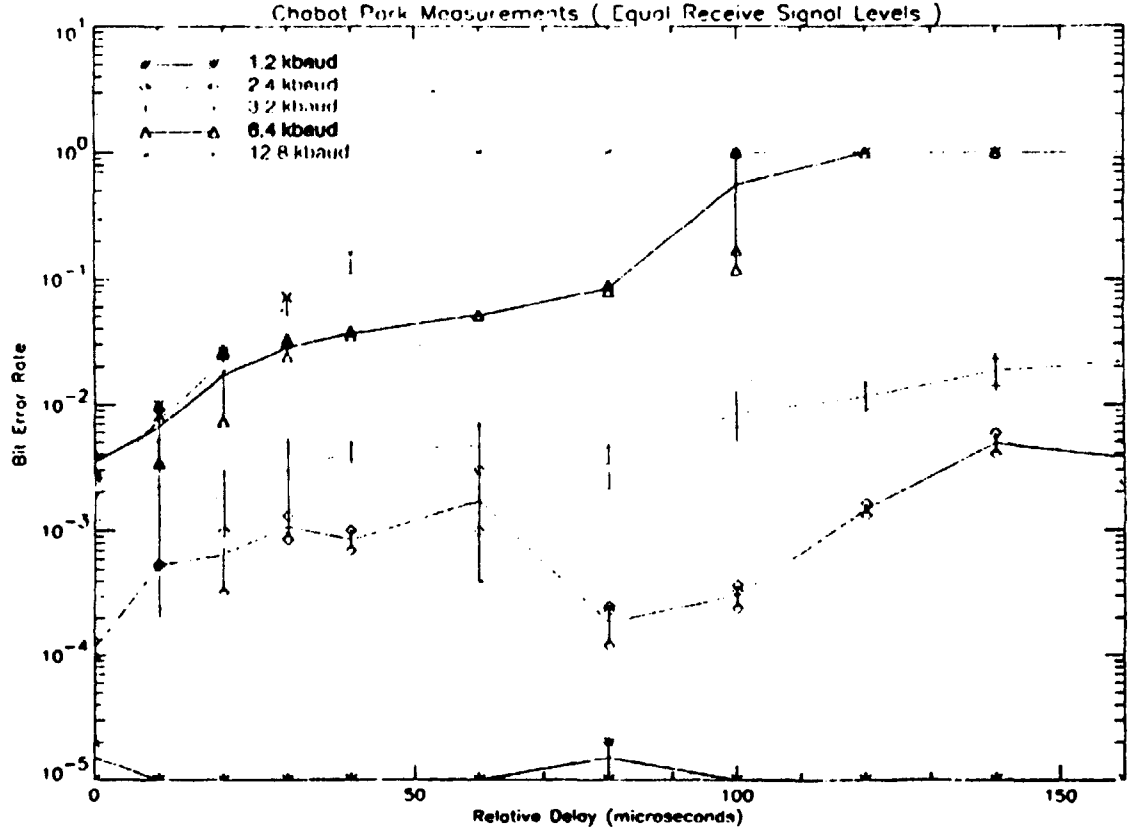
- Receive equipment placed in mobile van
- Receive vehicle also equipped with GPS to measure relative delays
- Measurements
  - Equal receive signal strength
  - Stationary
  - Site chosen to avoid temporal fades

Receiver Equipment and Vehicle





Results



Measured BER vs. Relative Delay

Conclusions

- Synchronization of transmit signals to within < 1 microsecond using GPS
- Present paging equipment operating at 1.2 kbaud provides a robust simulcast paging system under the worst case field measurement conditions
- The results suggest that an upper limit on data rate over the air is approximately 3.2 kbaud. This assumes an appropriate coding scheme
- Phasing of the frequency references causes a finite BER at zero delay
- For the test equipment used, approximately 10 dB is required to make the detection process independent of delay for significant relative delays, 50% of bit duration

Future Work

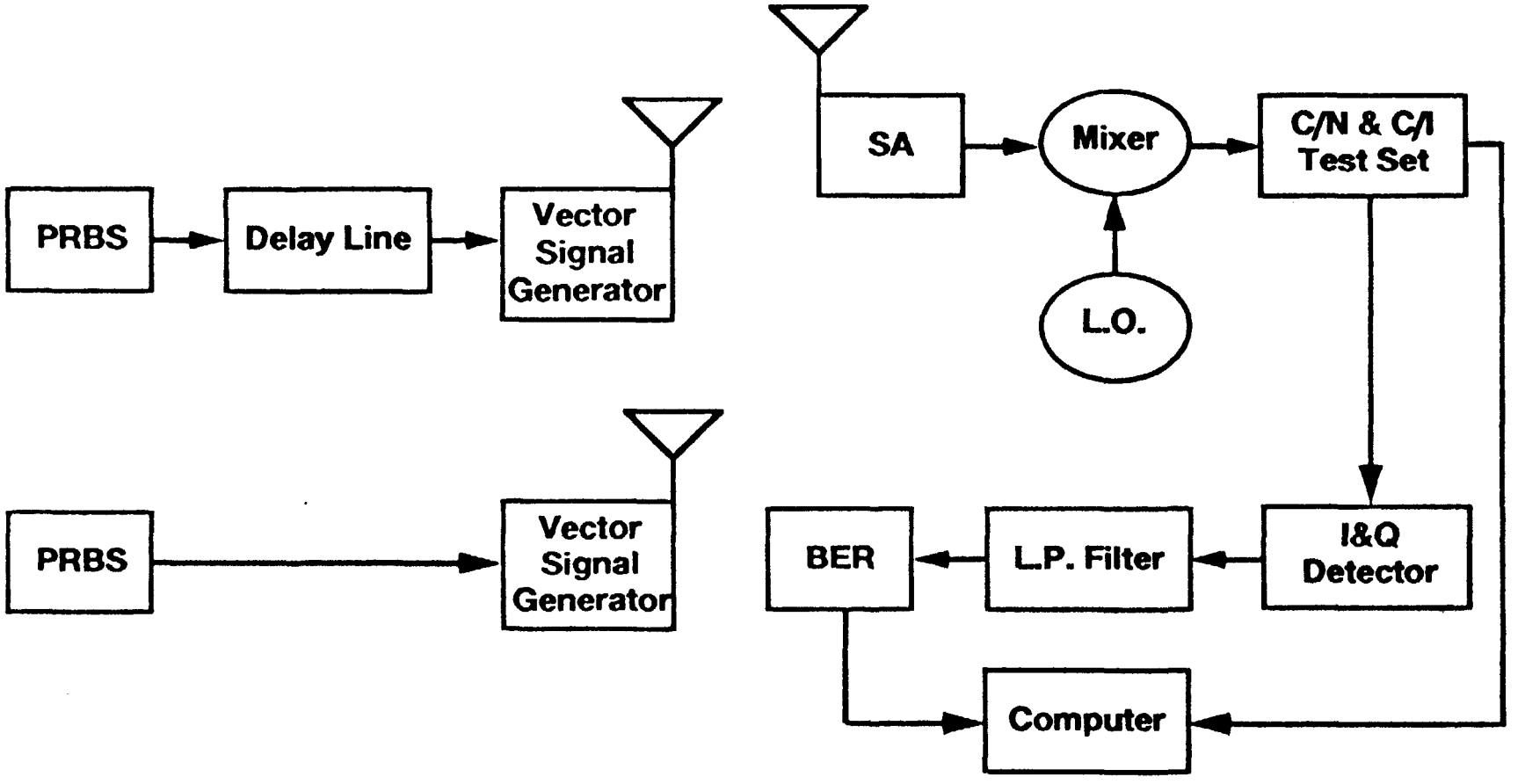
- An investigation of different modulation and coding schemes.
- Additional measurements in a suburban location.
- Additional measurements investigating the effect of relative frequency offset.
- Combining field trial results and prediction tools to identify simulcast problem areas and their respective size as a function of data rate.

Modulation Schemes

- The simulcast environment provides a fundamental limitation on the over-the-air data rate - 3.2kb/s, possibly 4.8 kb/s (? to be tested)
- Investigation of multi-level modulation schemes to increase effective data rate:
  - Multi-frequency FSK
  - Multi-level FSK

  extending effective data rate from 6.4, 9.6 kb/s
- More complex scheme possible with the latest technologies:
  - 16QAM offering 19.2 kb/s
  - SS/CDMA
- Constraints:
  - Size, cost and power consumption of pager
  - Adjacent channel interference
  - Power amplifier technology
  - Control Equipment
  - System Cost

Modulation Schemes Test Hardware

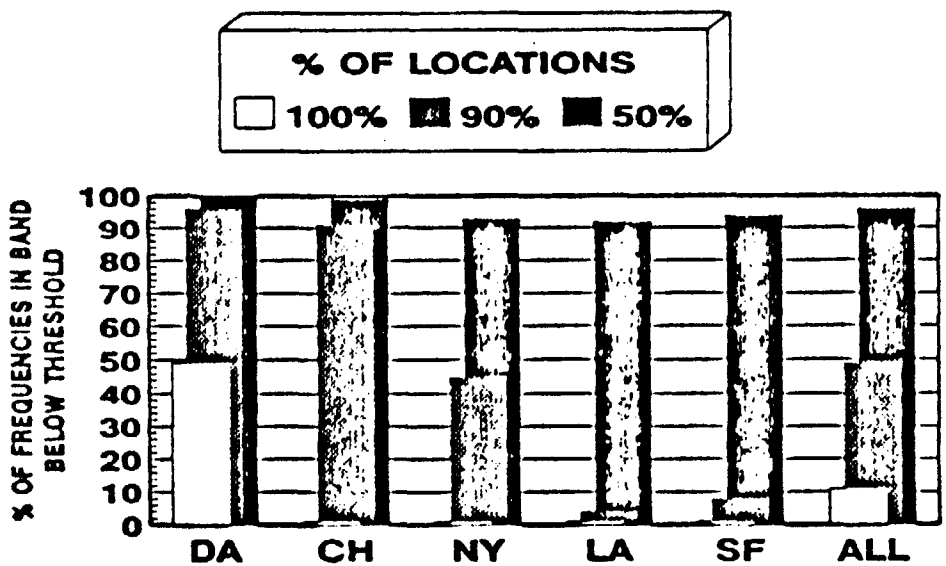


Spectrum Usage Measurements

- Objectives: determine the relative degree of current spectrum usage
- Methodology:
  - Five cities, New York, Chicago, Dallas, San Francisco and Los Angeles
  - 14 frequency bands from 600 to 2,500 MHz
  - 37 geographic locations were chosen on a square grid about the center of each city
  - Measurement locations were selected at the intersection points of the grid - 5 mile spacing
  - Measurement were made from small receiving van
  - Measurements at each site lasted 30 minutes - not long enough to develop temporal statistics but provided good statistics of the geographical variability
  - Receiving parameters : 10 kHz bandwidth, 3kHz video filter, sampling detector
- Other considerations:
  - Spectrum Usage depends on receiver bandwidth
  - No account has been made for existing receivers
  - Signal levels are measured with a vertically polarized antenna

GPMRS Spectrum Usage Results

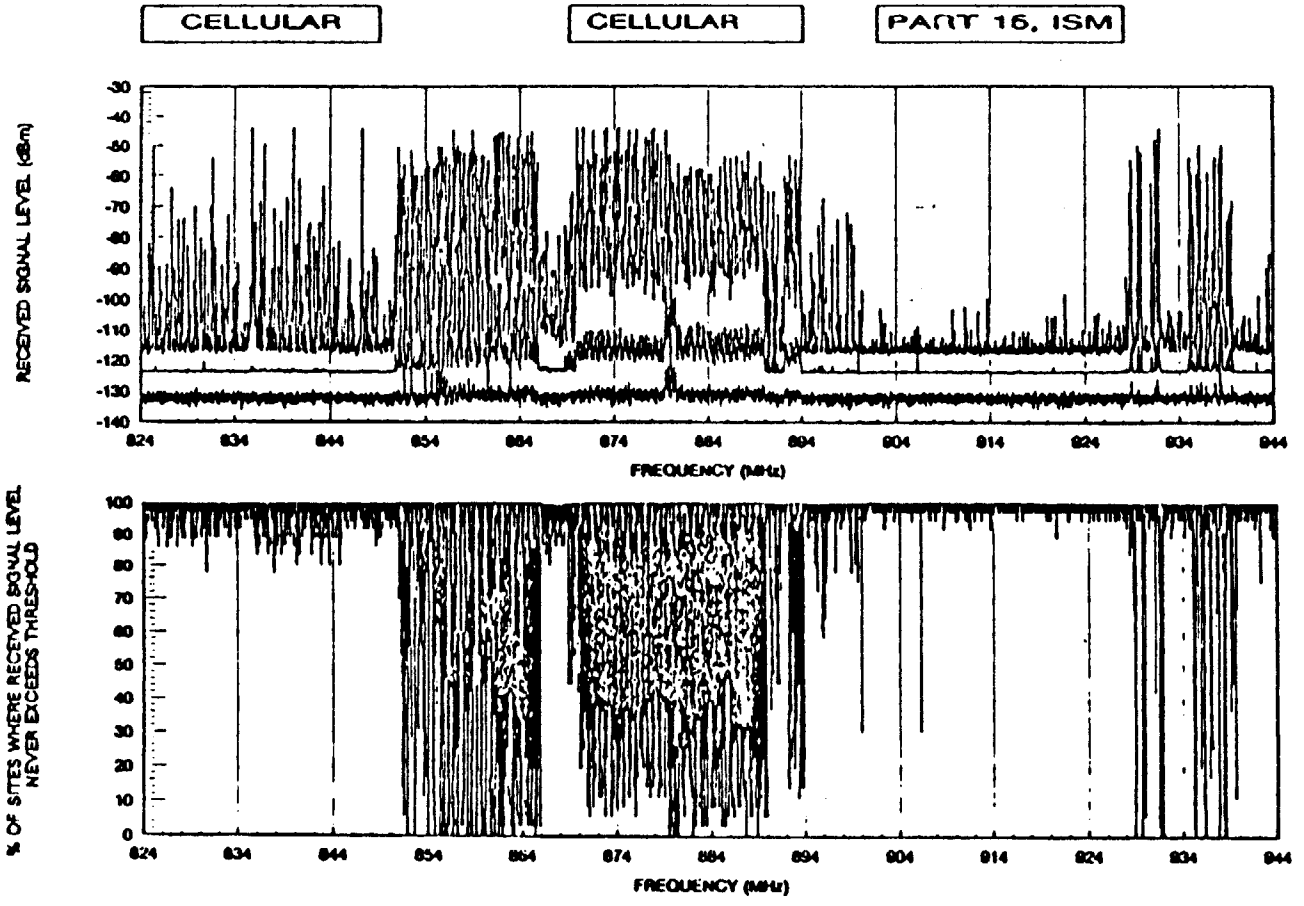
- Threshold = -115 dBm



Measured band usage for all cities, 930-931 MHz

- Example:
  The 50% number is the percentage of the band unused at the typical (median) site (i.e. percentage of band unused at the busiest site after the busiest 50% of the sites have been discarded)

GPMRS Spectrum Usage Results



Signal level (top) and measured frequency usage (bottom) plots for Dallas 824 - 944 MHz

GPMRS Spectrum Usage Summary

- 930 - 931 MHz band show noticeable usage
  - Observations from the measurements show significant transmitter noise sidebands of the adjacent paging bands or intermodulation distortion from the measurement system in all cities except Dallas
  - Measurements indicate importance of maintaining sufficient adjacent channel interference (i.e. no sidebands). Coordinating two-way paging with many providers within 1 MHz @ 900 MHz may not be feasible